Outline of the proposed research topic

“Bio Systematic Studies On Cestode Parasites Of Freshwater Fishes And Mammals From Parbhani District (M.S.) India”.

Pre-Synopsis Submitted for

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Introduction

The word ‘Helminths’ was first used by Aristotle (384–322 B.C.) for some of the worms found parasitic in animals (Hugot et al., 2001). The study of Helminthic diversity is very important from the medical point of view because parasites cause some diseases to animals and human health. Thus an attempt is being made to study the Piscean, avian and mammalian tapeworms and geographical distribution from various places of the Marathwada region (M.S.) India. (S. S. Nanware et.,al 2019) Helminths are an important group of pathogens, which cause infection and diseases of fish both in the freshwater and marine environment, their importance being related directly to the fish that way affects the general public health (Hoffman, 1967).

Parasitic disease is the single most important factor threatening the fishery industry worldwide, particularly in the tropics (Williams and Jones, 1994; Schmidt and Roberts, 2000). Parasites are enormously abundant and diverse in nature, representing a substantial portion of global biodiversity. Fishes are parasitized by helminth parasites, which reduce the food value of the host fish (Dhanraj B. B., 2014). Parasitology is the branch of biology that deals with the study of Parasites. Parasites are present in the body of an organism. Parasites are of two types Ectoparasite & Endoparasite are present inside the body of an organism. It occurs from class Pisces to class Mammals (P. S. Bele, 2015).

Cestodes are known to humankind for a long time. Tyson, Andry, Frisch, Linnaeus, and Pallas in the 16th–17th Centuries were the pioneers of cestode taxonomy (Wardle et., al 1974). Cestoda is the name given to known monophyletic assemblage, commonly called Tapeworm, of exclusively parasitic platyhelminths. Cestode is elongated and dorso-ventrally flattened and segmented bodies. Generally, the body is divided into Scolex, Neck, and proglottids (Deshmukh S. S. et al., 2019).

Cestodes have perfectly adapted to a parasitic mode of life amongst all the helminths and inhabit the intestinal tract of almost all the vertebrates including humans in their adult stages. Cestodes or tapeworms are parasites present inside the intestine and remain attached to the host. The ribbon-shaped body of tapeworms is the largest and among the oldest of the intestinal parasites that have plagued humans and other animals since time immemorial. They are cosmopolitan in distribution and exist in many forms. There are 14 orders of Eucestoda. Most of the cestode orders (except Cyclophyllidea) have members that can infect fish (both Chondrichthyes and Osteichthyes) as adults. Eight cestode orders Amphilinidea, Spathebothriidea, Caryophyllidea, Trypanorhyncha, Pseudophyllidea, Proteocephalidea, Haplobothriidea, and Nippotaeniidea are characterized by freshwater fish. Many cestodes are known to be the agents of serious fish diseases and also represent an important public health

problem (K Chandra et al.,2017).

Parasitism is a natural way of life, among a large number of organisms and parasitic diseases are a major public health problem, which results in morbidity and mortality in tropical countries, including India. Particularly in the socio-economically underdeveloped societies in the world (S.S.Nanware et., al, 2012).

Fish is a rich source of protein. It contains lipids, minerals, oils, And vitamins. Parasites affect fish health, growth, and survival. The cestode parasite causes many dangerous and serious diseases to the host (Deshmukh V.S. et., al). Fish play an important role in the economy. Mortality of fishes occurs due to heavy infestation of these parasites (D. B. Bhure). Fish are aquatic, marine, freshwater, herbivores or carnivores, cold-blooded, oviparous, or ovoviviparous vertebrate animal. The body is usually spindles shaped, streamlined, and differentiated into head, trunk, and tail. Fish are important components of the ecosystem from an ecological, medicinal, nutritional, and economic point of view. Fish constitute a major component of the diet of the human being. They are extensively used as a protein-rich food for human consumption. From a medicinal point of view, Fish provides vitamins like A, D, E, K, and B12, fish manure, fish glue, dried fins, fish leather, etc .besides being rich in calcium, iron, phosphorous, and iodine for the human diet (K. D. Kaldate 2013).

Some of these can be deleterious to the health of their hosts and have been incriminated as agents of diseases in farmed fish. Schmidt (1986) listed 3,806 known cestodes belonging to13 orders, 66 families, and 601 genera. Of these, approximately half are parasites of fish; they include groups such as the Caryophyllidea, Lecanicephalidea, Trypanorhyncha, Tetraphyllidea, Diphyllidea, Proteocephalidea, Pseudophyllidea, Spathebothriidea and Nippotaeniidea (Yang Wenchuan 2007).

These fish are parasitized by helminth parasites, which reduce the food value. They infect man and also invade domestic animals and wildlife. Keeping in view, the importance of these cestode infections of freshwater fish, the present study was designed to evaluate the prevalence of cestode parasitizing freshwater fish (D. B. Bhure et., al, 2011).

Sheep and Goats are Important livestock in India due to their nutritional and economic value, The Gastrointestinal cestode parasites cause great loss in the nutritional and economic value of the host in different ways like lowering of fertility, reduction in food intake, reduction in milk and meat production, reduction in weight of host and maybe mortality in heavily parasitized animals furthermore parasitosis appears to be a major factor for lowered productivity of Indian livestock. Hence the study of helminth parasites is needed today.

Fishes and mammals are the important components Of the ecosystem. They Are very

important From an ecological and economical point of view. Man uses Many Fishes and mammals as delicious and nutritious food. Helminth parasites in sheep and goats and in some circumstances do cause severe losses. These range from decreased utilization of feeds in unthrifty animals to death. Goats and sheep have gastrointestinal parasites, many of which are shared by both species. The most important include cestodes (tapeworms), nematodes (roundworms), and trematodes (flukes). Helminth parasitism, especially, gastrointestinal parasitism, is one of the major health problems severely limiting animal production in dairy animals. Despite significant production losses, which may run into millions of rupees (Shah and Choudhary). The problem is neglected due to its chronic and insidious nature (Sanyal, 1998). The diverse agro-climatic conditions animal husbandry practices and pasture management largely determine the incidence and severity of various parasitic diseases in the Aurangabad region.

Cestodes are harmful to vertebrate class Pisces to class Mammals. Therefore study of cestode from the taxonomical, histopathological and biochemical point of view is important.

REVIEW OF LITERATURE

Parasitology in its literal sense may go to encompass a wide canvas and parasites Yamaguti (1934,1959)., Woodland (1923,1924) Southwell (1930), Baylis (1928), Burt, etc. are the pioneer workers in the field of parasitology. Studies on cestode parasites were initiated in the early 19th century it's self by scientists, but they received momentum in the 20th century. To date, around 30,000 species of cestode parasites were recorded from freshwater fish. In India Singh, Johri 1959), Bhalerao (1932,1937), Moghe (1925), Thapar (1938), Gupta, S.P (1953). Ramadevi (1973), Nama (1974), Malhotra & Capoor (1980), Singh (1995), Shinde & Jadhav (1970) Nanware, S. P. Chavan, Bhure, Pawar, Tondon V. (2005) Pande (2007), Ali, Sham Sundar Simha, K. Hanumantha Rao, K.Shamasundari, R.Madhavi, Nama, G.B.Shinde, B.V. Jadhav, Agrawal, Hafeez, C. Vijayalaxmi, Manna, Chopra, B. Raghavendra Rao, Ratnamala Rao, M.Z.Chisti etc. are worked on the various aspects i.e. taxonomy, diversity, population dynamics, histopathology, life cycle, and biochemistry of helminth parasites from different vertebrates for the last many decades. G. Mani, Pandey, Shivesh P. Singh, H.S. Singh, Shrivastav, V. Tandon, Sandeep Malhotra, and C.J. Hiware are still working on various aspects i.e. taxonomy, diversity, population dynamics, histopathology and biochemistry of helminth parasites from different vertebrates. The present investigation deals with the taxonomy of cestode parasites including the genera like *Lytocestus* (Cohn, 1908), *Senga* (Dollfus, 1934), *Circumoncobothrium* (Shinde, 1968)

The genus *Gangesia* was erected by Woodland in 1924 with its type species *G.macrons* collected from the *Macronesseenghala* from India. Southwell (1930) however recognized only four valid species of the genus, others being regarded as synonyms and *G. parasite* was reported by Yamaguti in 1934. Later on Wardle McLeod, (1952) accepted Verma's *G. pseudotropii* which is proposed as a new genus *Vermala* by Nybelin, (1942) but later Dhar et al., (1980) added on more species and gave a revised diagnosis of the genus *Gangesia* and proposed to divide genus *Gangesia* Woodland (1924) into two sub-genera as *Gangesia* (*gangesia*) and *Gangesia* (*v*ermaia). Later on many species are added to this genus. In 1948 Singh described *G.lucknowia.* Roitmann et.al. in 1964 added *G.polyonchis*. Later Dhar and Fotedar added new species in 1980 *G.kashmirensis*.

G. synthesis species added by Malhotra et.al.in 1980. *G.mehmadabadensis* in 1981 added by Malhotra et.al. Later on Gupta and Arora added *G. haryanaei* in 1982. *G. indica* in 1982 added by Gupta and Parmar. Later Seth and Capoor in 1982 described *G.hanumanthai*. *G. paithanesis was* described in 1983 by Jadhav et.al. In1984, *Gangesia fotedari* was described by Dhar and Majdah as a catfish.Deshmukh et.al. in1989 added *G.shindei*. Later on in1990 Shinde and Wankhede described *G. aurangabadensis*. After 9 years in 1999 Hiware added *G. senghali*. Later in 2001 Jadhav et.al. added *G. clariusae*. In 2004 Wankhede Hemlata described *G. mastacembli*. Again in 2004 Pawar et.al. added *G.rohitae*. Hiware et.al. added *G. ambikaei*in 2004. *G. batrachusi was* added later on by Begum in 2007. In 2010 *G. wallaguae was* added by Pradhan et.al. In 2011 *G.bendurensis was* described by Reddy et.al. *G. jayakwadensis* in 2012 added by Shukla et.al. Later *G. shivajiraoi was* added by J. Dhole in 2012. *Gangesia cirrhinae* was described by Patel et al. from the cyprinid fish *Cirrhina mrigala* , Bhavare, and Shukla described a new species *G. jayakwadensis* from the walking catfish *Clarias batrachus*, Chavan proposed two new species, *G. attui*, and *G. parbhaniensis*, from *W. attu*, *G. haryanae* was described by Gupta and Arora from *W. attu* Malhotra et al. described *G. sanehensis* from the cyprinid *Cirrhina mrigala* in 1980 Fotedar and Dhar described *G. jammuensis* from *W. attu* in 1980 Gupta and Arora misidentified specimens of *G. agraensis* from *W. attu* as *G. parasiluri*

The genus Senga was erected by Dollfus in 1934 with its type species *S.besnardi*. Later on many species are added to this genus. In 1933 Teseng described *S.ophiocephalina*; Woodland,1934 added *S.pcynomera*. Johri, 1956 described *S.lucknowensis*. In1964, Furnando, and Furtado added *S.malayana*and *S.parva*. Lateron Furtado et. al, 1971 added *S.pahangesis*. In 1973 Ramadevi et.al.,described *S.visakhapatnamensis*. In 1980 three species are added i.e. *S.khami* by Deshmukh et al., *S.godavarii* by Shinde et. al., and S.*aurangabadensis* by Jadhav et.al. Kadam et.al., 1981 added *S.paithanensis*. Majidet.al.,

1984 described *S.raoi* and *S.jagannathae*

In 1991 Jadhav et. al. added *S.gachuae*and *S.maharashtrii*; Monzer Hasnain, 1992 added *S.chauhani*. Tat et. al., 1997 added *S. mohekarae*. In 1993 Hiware described *S.armatusae*. Patil et. al. 2003 added *S.tappi*. 2006 Pande et.al. described *S. ayodhensis* and *S. baughi*. in2008, described *Senga madhavii* and *Senga sataraensis* by Bhure D.B., in 2009 Mangale et al ., added *S. panzaraensis*, in 2009 Wankhede et al., added *S. kaigaonesis*, in 2010 Minaz N. Attar added *S. govindi*

The genus *Circumoncobothrium* was erected by Shinde in 1968 with its type species *C.ophiocephali* later on many species were added to this genus In 1976 Jadhav et.al., added *C.aurangabadensis*, and *C. gachuai*. Chincholikar et.al. 1976 added *C. shinde* and *C. bagariusi*. Shinde added *C. khami* in 1977, *C.alii* in 1994; *C. armatusae* in 1999; *C. mastacembelusae* in 2002. Jadhav et.al., 1990 described *C. yamagutii*. In 1998 added *C.vadgoanensis*by Patil et. al. and *C. baimii* by Wongsawad et. al. Kalse et. al., 1999 added *C. punctatus & naidue* (2009) Later in 2002 Pawar et. al. described *C. armatusae*. Tat et.al. 2004 described *C.manjari*. Further in 2005 added *C. vitellariensis* by Supugade et.al. Later 2008, described *C.mangalbaiae* and *C.govindae* by Bhure D.B., Nanavare S.S. et al., works on the study of fish cestodes genus *Silurotaenia* and also works on population dynamics in the year of 2011-2012. Borde S.N. et al., 2008 added *C. purnae*, Shah et al., 2010 added *C.paithenesis*, Menkudle et al., 2010 added *C. thapari*, Pardeshi et al., 2011 added *C. jadhavae*, Kadam et al., 2011 added *C. clariasi*

Blanchard,1891 erected the genus *Moniezia*. Later On Skijabin and Schulz, 1937 divided this genus into three subgenera i.e. Moniezia, Blanchariezia and Baeriezia as well as he includes *M.(B.) benedeni*, 1879 in this genus. Monning, 1926 added *M (B.) pallida*. In India Jadhav et.al, added *M.(B.) aurangabadensis, M.(b.) bharalae* in 1985, Hiware added *M.(B.) jadhave* 1999, Nanware et.al, added M.(B.) *kalawati* 1999 Kalse et.al, added M.(B.) *murhari* 1999, patil et.al, added M.(B.) *warangarensis* in 2000, Deshmukh et.al, added M.(B.) *shindei* 2001, Pawar et.al, added M.(B.) *shindei* 2004, Pokale et.al, added M.(B.) *capai* 2004, Tat et.al, added M.(B.) *hircusae* 2004, Nanware et.al, added M.(B.) *maharashtrae*, *Kalwati*, *caprae* in 2010, Borde et.al, added M.(B.) *rajalaensis* 2007, Choudhari et.al, added M.(B.) *warudensis* 2010, Padwal et.al, added M.(B.) *govindae* 2011, patil et.al, added M.(B.) *vanamalae* in 2012, Kasar et.al, added M.(B.) *madhukarae* 2010, Shaikh et.al, added M.(B.) *mansurae* 2011,

The genus *Stilesia* Was erected by Railliet in 1893 with Its type species S: *globipunctata* In 1896, S. *vitlata* Is also added by Railliet. Wolf Ehugel, 1903 described S', *hepatica*. Later On Leiper, 1936 added S. *okapi*. In India Kadam et al, 1980 described S.

leperi. In 1981 Kalayankar Added S', *caballeroi*. Shinde et al, 1982 described S. *southwelii*, Jadhav et al., 1982 added S. *aurangabadensis.* Malhotra and Capoor, 1983 added two species to this genus i.e. S. *garhwalensis* and S. *kotwarensis*. S. *maratkwadensis* is added by Shinde et. al.,1985. In 1999 Two species are added To this genus i.e. S. *jadhavae* by Jadhav and S. *yawalensis* By Kalse et. al. In 2001, Deshmukh and Shinde added S. *dhondgae*. In 2004 four species Are added to this genus i.e. S. *pandeyi*, by Nanware and Jadhav, S *ambajogaiensis* by Pawar et.al, S. *indapurensis* by Khadap et.al, and S. *daulatabadensis* By Shelke And Shinde. Nanware et. al. added S. *jadhavi*. Recently Padwal and Jadhav described S. *govindae* in 2006 As many as five *Silurotaenia* spp., namely *S. paithanensis* Shinde, Majid and Solunke, 1983; *S. macroni* Shinde, Kadam, and Jadhav, 1984; *S. singhali* Shinde, Kadam and Jadhav, 1984; *S. shastri* Gavhane and Jadhav, 1991; and *S. raoii* Bhure, Pathan, Nanware and Dhondge, 2010, have been described from *S. seenghala* from India, all from the same state (Maharashtra). Two more species of *Silurotaenia* were described from Maharashtra, both from fish hosts not typical of proteocephalidean cestodes, namely *S. barbusi* from the barb *Barbus ticto* (=*Puntius ticto*) (Cyprinidae) by Shinde et al. and *S. behairvnathi* from the zig-zag eel *Mastacembelus armatus* (Mastacembelidae) by Deshmukh and Shinde.

Chavan proposed two *Silurotaenia* species, namely *S. makniensis* and *S. gangakhedensis* from *W. attu*, in his unpublished Ph.D. thesis

The genus *Avitellina* was erected by Gough in 1911 as a type species *Avitellina centripuctata* (Rivolta 1874) in *Ovis aries* later on species are added to this genus, in 1927 Woodland added *A. lahorea, A. sudanea, A. gouchi. A. chalmersi*, in 1983 Shinde added A. nagabhushanami in 1936 Bhalerao added *A. tatia, A. woodland* In 2005 Pawar et al., added *A. hircusae*

The genus *Aliezia* was erected by Shinde in 1969 its type specie, *Aliezia indica* from sheep. *Ovis bharal* in 1979 Shinde et al ., added *A. aurangabadensis*, in 2004 Lakhe et al ., added *A. Kaijensis*, in 2005 Khadap et al ., added *A. Mohekarae*, in 2009 Makne et al ., added *A. shivajiraje*

OBJECTIVES OF THE RESEARCH WORK:

Present work is undertaken with the following objectives.

- To find out species of Cestode Parasites from Freshwater fishes and some Mammals from Parbhani District.
- To study the Morphological and Taxonomical of Identified cestode parasites of Freshwater Fishes and Mammals.
- To analyze population dynamics of cestode parasites of freshwater fishes and

Mammals.

- To study the Biochemical Profile of Identified cestode parasites from freshwater fishes and Mammals**.**
- Histopathological studies of cestode parasites from freshwater fishes and Mammals**.**

METHODOLOGY TO BE ADOPTED

Freshwater fishes and Mammals such as *Capra hircus* (goat) and *Ovis bharal* (Sheep) for exploration will be acquired from the Parbhani district.

Study Area:-Different localities of the collection sites of freshwater fishes and Mammals in Parbhani district (M.S.) India.

❖ Taxonomy:

The following steps should be conducted as

- Collection of cestode parasites of freshwater fishes from Live Fishes and some Mammals from the various locality in Parbhani district.
- Collection in normal saline solution ,boiled 4 % Formation used for Fixation
- Staining of cestode parasites in Harri's Hematoxylin stain.
- Mounting in DPX/ Canadabalsm.
- Identification under the microscope for taxonomical study.
- Scaning Electron Microscopy of Cestode parasites with Camera lucida drawings

❖ Histopathology:

- Infected and Non-infected host intestines should be fixed in fixative bouin's fluid.
- Block preparation.
- Section cutting of prepared blocks.
- Staining of prepared slides.
- Identification of slides for histopathology study.

❖ Biochemistry:

Biochemical contents will be estimated by following standard methods.

- **Glycogen Method/ estimation:-**

  Glycogen will be estimated by the Kemp et.al., method (1954).

- **Protein estimation:-**

  Protein will be estimated by the Gornall et.al., method (1949).

- **Lipid estimation:-**

  Lipid content will be estimated by the Folch et.al., method (1957).

IMPORTANCE OF STUDY

INTERNATIONAL STATUS:

Parasitic diseases of fifth are very common all over the world and are of particular importance in the tropics (Roberts and Janovy,2000). Helminth parasitization is one of the major factors responsible for the decline of fish fauna and Mammals worldwide.). Intestinal Cestodes may affect the nutritional status by causing increased nutrient loss, in addition to decreased food intake and nutrient absorption (Edirisinghe and Tomkins, 1995). Due to the global incidence of helminth infections in fishes, their detailed study would give proper identification of these infections and help reduce them by designing control measures. Cestode infections are a major global health concern because of their high prevalence and ill effects on both the nutritional and immunological status of human populations. Recent reports suggest that fish act as a source of serious human parasitic infectious disease (Dubois and Pearson, 1963), Sehnurrenberger, 1975) and parasites are important in that they affect the productivity of the fish in the system through metabolites by decreasing the growth rate, reducing the quality of meat, loss of protein source and making the hosts more susceptible to other pathogenic parasites i.e.over all loss of economy.

Intestinal tapeworm infections are very common all over the world they disturb human health and invade the domestic and wildlife of vertebrates including fish and man. Cestodes are a group of endoparasitic helminths that almost exclusively occupy the alimentary canal in preference to other common sites (Smyth and McManus 2007). Histopathological investigations such as marked lesions in the mucosa inflammation and congestion of mucous glands and intestinal hemorrhages lead to **a** severe anemic condition in the fish. (Williams, 1967; Roberts, 2001). Amlacher (1961); Hayunga E.G. (1977) and Mackiewicz, (1972) have studied the histopathology of the intestine of fish caused due to cestodes.

In the field of Cestode taxonomy Miller, Goezer, Rudophi, Ehronberg, Leiper, Gegenbaur Vough, Linstow, Moniex, etc. worked in establishing the Cestode taxonomy as a fully-fledged branch of Zoology. The study of the chemical composition of the parasite is gaining importance in modern times. Nutritional deficiencies as a result of intestinal Cestode infection have been the subject of several investigations (Hadju, et.al. 1996; Lunn and Nothrop Clewes, 1996. Histopathological investigation such as marked lesions in the mucosa inflammation and congestion of mucous glands and intestinal hemorrhages lead to a severe anemic condition in the fish. (Williams, 1967, Roberts 2001).

NATIONAL STATUS

India has a large livestock population which is raised almost entirely by smallholder farmers throughout the country. Fish, Mammals (Goat and Sheep) are a particularly important resource of the country as they are providing more local meat for consumption and generate cash income from the export of meat from live animals. It is well recognized that helminth infection of these live animals is the major factor responsible for production losses in livestock in resources Fishes and Mammals are economically important as a food source of high nutritive value in India.

The study of cestode parasites of fishes has been done in India by many Researchers The Study of cestode of fishes in India was started by Moghe,1925 described *Lytocestus indicus* from, Verma 1927-1928); Subhapradha 1951-1957); Hymenolepis nana by Bailey 1951 Bawar et.al In India also a lot of work was conducted on Cestode taxonomy by eminent Cestodeologist like Thapar, Mehra, Pande, Srivastava, Chauhan, Mirza, Basir, Gupta N.K., Gupta S.P., Singh K.S, etc. on Biochemistry, Hiware C.J.(1999), Shendge A.N. (2008), P.Anilkumar et.,al.(2009), Shabana et. al.(2010).

India is among the 17 mega diversity countries (Mittermeir et al ., 1997) and hosts as many as 55 families of freshwater fish (Teleostei) (Froese and Pauly, 2012). It is estimated that about 10 million tons of fish are required annually to meet the present-day demand for fish proteins in India compared to actual annual production of only 3.5 million tons (Shukla and Upadhyay,1998). Anirban Ash 2012. Eminent helminthologists like Thapar, Mehra, Pande, Srivastava, Chauhan, Mirza, Basir, Gupta N.K., Gupta S.P., Ghosh, Pandey, Hanumantha Rao, Madhavi, Fotedar, Singh K.S., Barga, Singh R.N., Agrawal S.M., Gupta V., Ramlingam, Tripathi, Khera, Jairajpuri, Malhotra, Sood, Shinde, Singh H.S., Duda, Dhar, Raina, Khan, Chisti, and many others. At present Jaiswal, Agrawal, Md. Hafeez, Hiware, Wankhede, Mohekar, Chavan, Nanware Pawar, and others are concentrating on taxonomy.

An extensive study on the host-parasite relationship has been carried out by *Amoebotaenia indiana* by Mitra and Shinde (1980); *Hymenolepis nana* by Bailey (1951). Baur et.al. (1959). Amlacher (1961), Hyunga E.G. (1977), and Mackiewizc (1972) have studied the histopathology of the intestine of fish caused due to cestodes. Gopal Krishnan (1968), Satpute A. and Agarwal (1974), Ahmed et.al (1975), Bose and Sinha (1979) & 1981), Niyogi A.and Agarwal S.M.(1989) have studied the *Caryophyllacidiasis* in a fish host. A distinctive acute tubular epithelial necrosis associated with interstitial hemorrhages of the posterior kidney was originally described as hemorrhagic kidney syndrome in Atlantic Salman (Byrne et.al.1998, Shashi et.,al.2008). Bhure D.B., Nanavare S.S., et al, work on the study of fish cestodes genus *Silurotaenia* and also works on population dynamics in the year

2010-11. Hiware C.J. and Pardeshi P.R. also worked on the genus *Senga Sp*. in 2011-12. Hiware C.J. (2002) has studied the pathological changes in the intestine of *Clarias batrachus* infected by the *Lytocestus naldurgensis*, Hiware et.al. (2008) have studied the histopathology of the intestine of freshwater fish *Clarias batrachus* caused due to *Lytocestus clariasae*. Jaywant Dhole works on the taxonomic evaluation of the genus Gangesia in 2012-13. From freshwater fish *Wallago attu*. Sawarkar B.W. works on the investigation of *cestodes Siluretenia* (Nybelin,1942) works on this genus in 2013.

SIGNIFICANCE OF THE STUDY:

Studies of Parasites are important in that they affect the various organs of their hosts, and the productivity of the host by decreasing the growth rate, reducing the quality of meat, loss of protein source, and affecting the yield of fish products such as body oil, Liver oil, etc and this leads to major health problems.

Fish and Mammals are important components of the ecosystem. They are important from an ecological and economical point of view. Cestode causes commercial losses in both aquaculture and fisheries industries and may have human as well as social-economic

Fish production is an important source of income, and employment generation and plays an important role in the economy (Akhtar 1986). Fish carries heavy infection of the cestodes, whose occurrence is frequent, and hence there is a necessary need to study based on Morphology, Taxonomy, Biochemical profile, histopathology, and population dynamics of the cestodes parasites. Cestodes live in the intestine of fishes and mammals, the fishes and mammals such as goats, and cows are economically beneficial to the human population. The cestodes cause great suffering to the host Therefore need to study on morphology, taxonomy, histopathology, and biochemistry of cestode parasites of the host.

Proposed plan of work

Year-wise plan of work and targets to be achieved

A) First Year:

1. Review of literature, Visit to Various localities of Parbhani district for collection of freshwater fishes and collection of intestine from *Capra hircus* and *Ovis bharal* of different localities in Parbhani district.
2. Collection of cestode parasites from the intestine of freshwater fishes and mammals from different localities in the Parbhani district.
3. Preservation of cestode parasites.

4. A morphological and taxonomical study of the cestode parasite.

B) Second Year:

1. Collection, Preservation, staining, and mounting of cestode parasites.
2. Histopathological study of the host tissue.
3. To study the Biochemical profile of cestode parasites.
4. To record the obtained data for population dynamics study.

C) **Third-year:**

1. Collection Preservation, staining, mounting of cestode parasites.
2. Histopathological study of the host tissue.
3. To study the Biochemical profile of cestode parasites.
4. To record the obtained data for population dynamics study.

D) FourthYear:

Research paper publication, Thesis writing, and submission of Thesis.

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